

REMARKS

In response to the above Office Action, claim 1 has been amended to include the subject matter of claim 3, which has been cancelled, to recite that the fabric is a spun-bonded nonwoven fabric and has a variation ratio of a fabric weight, 10 cm x 10 cm, of 10% or less. Support for the amendments can be found in claim 3 and page 11, lines 20-23 of the specification.

In the Office Action, the Examiner rejected claims 1-2 and 9-11 under 35 U.S.C. §103(a) for being obvious over U.S. Patent No. 4,582,666 to Kenworthy et al., hereafter Kenworthy, in view of JP 06181688, hereafter JP'688. Claims 3 and 8 were similarly rejected further in view of JP 07136066, hereafter JP'066, and claims 4-7 were similarly rejected further in view of WO 98/50611, hereafter WO'611. It is noted these are all newly cited references and in the Office Action of April 3, 2007, the claims were only rejected under §112. Thus it is not understood why the Office Action of September 21, 2007 is a final rejection. Reconsideration and withdrawal of the finality of the Action is therefore requested. While a RCE was filed to avoid further extension of time fees, if the finality is withdrawn, applicants also withdraw the RCE.

The present invention relates to a nonwoven fabric excellent in transparency, showing decreased powder leakage and excellent bag formability, and causing no refuse problem in waste treatment, and to provide tea bags composed of the nonwoven fabric.

The constituent features of the present invention are the following (1) to (11), as disclosed in amended claim 1.

- (1) a fabric weight of 7 to 50 g/m²;
- (2) an average fiber diameter of 7 to 40 μm;

- (3) a partial heat contact bonding ratio of 5 to 30%;
- (4) a content of a delustering agent of 0.5% by weight or less;
- (5) a thermoplastic synthetic fiber spun-bonded nonwoven fabric;
- (6) the nonwoven fabric is a laminate of a thermoplastic synthetic fiber spun-bonded nonwoven fabric having an average fiber diameter of 7 to 15 μm and a thermoplastic synthetic fiber spun-bonded nonwoven fabric having an average fiber diameter of 15 to 40 μm ;
- (7) the nonwoven fabric has a variation ratio of a fabric weight, 10 cm x 10 cm, of 10% or less;
- (8) the nonwoven fabric has a maximum opening diameter of 200 to 2,000 μm ;
- (9) the nonwoven fabric shows a transparency of 50% or more;
- (10) the nonwoven fabric shows a powder leakage ratio of 10% by weight or less;
- (11) the nonwoven fabric shows a hydrophilicity of less than 10 sec.

Problems to be solved in a tea bag are an improvement in transparency and suppression of powder leakage. The present invention has solved both problems at the same time.

In general, improvement in transparency and suppression of powder leakage are contradictory to each other in a nonwoven fabric. Accordingly, to improve transparency, when a nonwoven fabric is coarsely formed in the space of the fibers, powder leakage increases. On the other hand, to suppress powder leakage, when a nonwoven fabric is

densely formed in the space of the fibers, the transparency deteriorates due to increased fabric weight.

The present inventors have found that a spun-bonded nonwoven fabric can have a preferable, maximum opening diameter (200 to 2,000 μm) and is excellent in both transparency and powder leakage properties, when the following matters are appropriately combined: the fiber size of the nonwoven fabric, the lamination of a nonwoven fabric having a small fiber size and a nonwoven fabric having a large fiber size; the range of fabric weight, the evenness in fabric weight; the partial heat contact bonding ratio; and the content of a delustering agent.

As a result of the above discovery, the present inventors have found that such a spun-bonded nonwoven fabric is excellent in both transparency and powder leakage properties, which heretofore has been impossible to achieve.

The present invention has excellent effects on the basis of the technical characteristics thereof. That is, the nonwoven fabric of the present invention has an excellent transparency of 50% or more and an excellent powder leakage of 10 wt% or less, as disclosed in Fig. 1 of the present application.

The present invention provides a nonwoven fabric low in fabric weight and even in fabric density by using a thermoplastic synthetic fiber spun-bonded nonwoven fabric. In particular, when the variation ratio of a fabric weight, 10 cm x 10 cm, is 10% or less, the nonwoven fabric can be even in a fabric weight, in a fiber-fiber distance and in a distribution of the opening diameter. As a result, the nonwoven fabric improves the problem of powder leakage due to large opening holes. Accordingly, the present invention provides a nonwoven fabric having improved powder leakage, even though

the nonwoven fabric is low in fabric weight which is advantageous in view of the transparency.

Moreover, since the nonwoven fabric of the present invention is a laminate of a nonwoven fabric layer having a small fiber size and a nonwoven fabric layer having a large fiber size, the resultant nonwoven fabric has improved transparency, because the nonwoven fabric layer having a small fiber size can suppress powder leakage while the nonwoven fabric layer having a large fiber size contributes to transparency.

As a result, the nonwoven fabric of the present invention is excellent in both transparency and powder leakage properties.

Kenworthy discloses a patterned nonwoven fabric produced by using a specific apparatus. It discloses that the nonwoven fabric is made of polyolefin fiber, has a fabric weight of 8 to 65 g/m² and an opening diameter of 450 μm, and is suitable for a tea bag.

JP'688 discloses a nonwoven fabric made of a filament having a fiber diameter of about 25 μm and is suitable for a coffee bag and a coffee filter.

JP'066 relates to a vessel-shaped multilayer filter and discloses a laminated nonwoven fabric having a multilayer structure.

WO'611 discloses a biodegradable nonwoven fabric made of an aliphatic polyester such as polylactide.

Comparison between the prior art and the present invention

Amended claim 1 has been limited to “a thermoplastic synthetic fiber spun-bonded nonwoven fabric” to clarify the present invention and distinguish it from the cited prior art.

The present invention provides a nonwoven fabric that is excellent in both transparency and powder leakage properties by appropriately combining the following constituent features resulting in a specific maximum opening diameter of 200 to 2,000 μm ; the laminate of a nonwoven fabric layer having a small fiber size and a nonwoven fabric layer having a large fiber size; the specific range in fabric weight), the evenness in a fabric weight (the specific range in a variation ratio of a fabric weight; the partial heat contact bonding ratio; and the content of the delustering agent.

There is no disclosure or suggestion in any of the cited references regarding the important features of the present invention, such as a laminate of a nonwoven fabric layer having a small fiber size and a nonwoven fabric layer having a large fiber size, a variation ratio of a fabric weight and a content of a delustering agent.

The present invention results in a nonwoven fabric that is excellent in both transparency and powder leakage properties because it has a structure composed of the specific thermoplastic synthetic fiber spun-bonded nonwoven fabric having the specific range in a maximum opening diameter. In particular, when the maximum opening diameter is 200 to 2,000 μm , the nonwoven fabric has excellent transparency of 50% or more and excellent powder leakage of 10 wt% or less.

This is unexpected considering conventional technology, and has been accomplished for the first time.

Because there is no disclosure or suggestion in Kenworthy regarding this specific relation and the remarkable effects obtained, the present invention could not easily be conceived by a person with ordinary skill in the art based on this reference.

Moreover, the nonwoven fabric is low in fabric weight and in fabric density. In particular, when the variation ratio of a fabric weight, 10 cm x 10 cm, is 10% or less, the nonwoven fabric is even in fabric weight, in fiber-fiber distance and in the distribution of the opening diameter. As a result, the nonwoven fabric improves the problem of powder leakage due to large opening holes.

Furthermore, there is no disclosure or suggestion in Kenworthy or JP'688 regarding a laminate of a nonwoven fabric layer having a small fiber size and a nonwoven fabric layer having a large fiber size, or that the resultant nonwoven fabric has improved transparency and powder leakage.

The Examiner states in the Office Action (on page 3, lines 10 to 14) that the features such as heat contact bonding ratio, transparency, powder leakage and hydrophilicity would be exhibited in the nonwoven fabric provided by the combination of the cited prior art.

However, since these features are not disclosed in any of the prior art cited by the Examiner, a person with ordinary skill in the art could not conceive to determine the above features within the specific preferable ranges, and as a result, could not obtain the nonwoven fabric of the present invention suitable for a tea bag. This is only possible after reading applicants' specification. Also, the Examiner states in the office Action (on page 3, lines 7 to 8) that the recitation of "or less" includes the value of zero. The content of the delustering agent may include the value of zero, as clearly disclosed on page 7, lines 15 to 23 of the specification.

However as explained above in detail, there is no disclosure or suggestion in the cited references regarding the remarkable effects obtained by the present invention

based on the differences in the structure of nonwoven fabric. Therefore, it is clear that the present invention as set forth in amended claim 1 could not easily be conceived by a person with ordinary skill in the art based on these references.

Moreover, it is clear that claims 2 and 4-11 are also not obvious since they depend from claim 1.

It is believed claims 1, 2 and 4-11 are in condition for allowance.

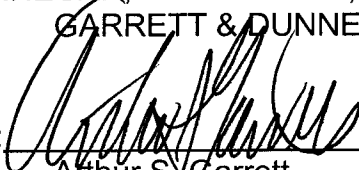
In view of the foregoing remarks, Applicants submit that this claimed invention, as amended, is neither anticipated nor rendered obvious in view of the prior art references cited against this application. Applicants therefore request the entry of this Amendment, the Examiner's reconsideration and reexamination of the application, and the timely allowance of the pending claims.

Please grant any extensions of time required to enter this response and charge any additional required fees to Deposit Account 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: January 22, 2008

By: 
Arthur S. Garrett
Reg. No. 20,338
(202) 408-4091

1520717_1.DOC